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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,049	07/09/2004	Mikko Kokkonen	59643.00483	1658

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EXAMINER

MATIN, NURUL M

ART UNIT	PAPER NUMBER
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2635

DATE MAILED: 10/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/501,049

Applicant(s)

KOKKONEN, MIKKO

Examiner

Nurul M. Matin

Art Unit

2635

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 38-74 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 38-54 and 56-74 is/are rejected.
- 7) ☐ Claim(s) 55 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

VULE
SUPERVISORY PATENT EXAMINER

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 38-46, 53 are rejected under 35 U.S.C. 102(b) as being anticipated by Cheong (WO 00/52845).**

Re claim 38, Cheong discloses a receiver (fig.1, page 10, line 29) for receiving a plurality of signals (fig.1) at the same time, said receiver comprising: a plurality of receiving elements (fig.1, page 8, line 21-22, "receiving x1 and x2") each of which is arranged to receive a composite signal (page 8, line 23-24, "combination of signals x1 and x2") including at least some of said plurality of signals; processing means (page 4, line 4-5) for receiving said plurality of receiving elements composite signal and providing an estimate of at least two (page 4, line 6-8) of said plurality of signals (x1 and x2) said processing means being arranged to provide an estimate (decoder) of a first one of said signals(page 22, line 14-15, "the first decoder 700 is configured to calculate the expected value for each of the symbols in the primary data signal x1") and then to provide an estimate of a second one of said signals("second decoder 702 is configured to calculate the expected value for each of the symbols in the superimposed cross talk signal x2") wherein said processing means is arranged, for each already determined estimate to extend the estimate with a plurality of potential values, wherein said

estimate of said second one of said signals takes into account the estimate of the first signal (page 22, line 22-23, "the expected values computed by the first decoder 700 are arranged to be inputted into the second decoder 702") and the estimate of the first signal can be modified in dependence on the estimate of the second signal (page 22, line 23-24, "the expected values computed by the second decoder 702 are arranged to be inputted into the first decoder 700")

Re claim 39, a receiver as claimed in claim 38, wherein said processing means is arranged to provide an initial estimate of said plurality of signals, said processing means using said initial estimate as a first value for said first and second estimates (fig. 3: 303, page 11, line 1-10).

Re claim 40, a receiver as claimed in claim 38, wherein said processing means is arranged to provide an estimate of at least three signals (x_1 , x_2 , y) and the estimate of each successive signal takes into account the previously determined signal estimates (fig. 1, page 8, line 25-9, "the cross talk interference may also be simultaneously received from two or more specific transmitters), for example, a third signal emanating from an end user 118C may also be superimposed on the first signal x_1 ").

Re claim 41, a receiver as claimed in claim 38, wherein said processing means is arranged to provide an estimate of at least three signals and any one or more of the previously determined estimated can be modified in dependence on a current signal estimate (fig.1, page 8, line 25-29, " a third signal emanating from an end user 118C may also be superimposed (or modified) on the first signal x_1 ").

Re claim 42, a receiver as claimed in claim 38, wherein said processing means is arranged to determine the order in which the signals are estimated (page 4, line 8, page 10, line 5, it shows that signals are estimated one after another or in order).

Re claim 43, a receiver as claimed in claim 42, wherein said processing means are arranged to determine the order in which the signals are estimated taking into account at least one of received signal level and signal to noise ratio (fig. 6, page 20, line 6-32, "the line monitor determines the noise level, gain and phase shift on each of the subchannels. The object is to estimate the signal-to-noise ratio for each of the subchannels").

Re claim 44, a receiver as claimed in claim 38, wherein said potential values comprise constellation points (page 17, line 8-12, " although only a 2 bit [as potential values] output constellation is shown and described, it should be noted that this is not a limitation and that other output constellation could be used").

Re claim 45, a receiver as claimed in claim 44, wherein said estimate is extended by every possible constellation point (page 17, line 8-12, and "estimate is extended as the constellation point is increasing For example, a 4 bit constellation, 5 bit constellation, a 6 bit constellation and the like").

Re claim 46, a receiver as claimed in claim 38, wherein said plurality of potential values comprise potential values for a currently estimated signal (fig. 7, page 22, line 12-20, " decoder (means estimation) 700 is arranged to compute a probability distribution P1 for each of the possible values for the primary data signal x1 and

decoder 702 is arranged to compute a probability distribution P2 for each of the possible values for the superimposed cross talk signal x2").

Re claim 53, a receiver as claimed in claim 38, wherein said processor is arranged to treat those signals for which an estimate has not yet been determined as noise. Here basically it says we need the processor for the signal to get the noise, which is well known, in the art.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 47-50, 52 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheong (WO 00/52845) as applied to claim 38 above and further in view of Hafeez et al, US 6304618.

Re claim 47, Cheong fails to teach that a metric is determined for the extended estimates. However, Hafeez discloses such aspects (col. 2, line 40-45) in which a channel estimates are produced for the plurality of transmitted signals, and metrics are computed using the sample streams and the channel estimates.

Therefore, the combined teaching of Cheong and Hafeez as a whole would have rendered obvious the arrangement of the metric to determine the extended estimate as

claimed for the benefit to detect the information symbols corresponding to the transmitted signals.

Re claim 48, the combined teaching of Cheong and Hafeez further teaches that at least some of said extended estimates are discarded in dependence on the determined metric (Hafeez, col. 3, line 6-10). Hafeez teaches that the information symbols may be detected by storing path information that is associated with a plurality of paths, and extending the paths by hypothesizing symbol values and computing metrics. Paths may be discarded based on the metrics.

Re claim 49, the combined teaching of Cheong and Hafeez further teaches that one or more existing estimates are discarded if a determined metric is better than that of said one or more existing estimates (Hafeez, col. 3, line 38-49). Hafeez teaches that the channel estimates may be initialized for the plurality of transmitted channels and the metrics may be initialized for the sample streams based on the known information symbols.

Re claim 50, the combined teaching of Cheong and Hafeez further teaches that a metric is based on a function of the currently determined estimates and the received signal (Hafeez, col. 3, line 25-26). Hafeez teaches that the metrics are computed using the received signal and the channel estimates.

Re claim 52, the combined teaching of Cheong and Hafeez further teaches that a metric is calculated for a signal estimate at least partially from metric values stored during the calculation of a previously determined estimate (Hafeez, col. 2, line 65-67,

col. 3, line 1-5). Hafeez teaches that the metrics may be computed by estimating received values using the channel estimates and the hypothesized symbol, and computing the metrics using the estimated received values.

Re claim 56, the combined teaching of Cheong and Hafeez further teaches that receiving elements comprise antennas (Hafeez, col. 4, line 25-30). Hafeez teaches that a second transmitter 102b converts a second independent symbol stream $a_2(n)$ into a radio waveform for transmission using antenna 104b.

5. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cheong (WO 00/52845) in view of Hafeez et al, US 6304618 as applied to claim 50 above and further in view of Decker et al, US 4980897.

Re claim 51, the combined teaching of Cheong and Hafeez as a whole fails to teach that a function is a squared Euclidean distance between said currently determined estimates and the received signal. However, Decker discloses such aspects (fig. 11, col. 12, line 3-12) in which a multi-channel trellis decoding consists of 2 basic steps: finding the squared Euclidean distance of the received point to the nearest neighbor in each subset. Therefore, the combined teaching of Cheong, Hafeez and Decker as a whole would have rendered obvious using the squared Euclidean distance as claimed for the benefit of the performing maximum likelihood sequence estimation.

6. Claim 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cheong (WO 00/52845) as applied to claim 38 above, and further in view of Hafeez et al, US 6304618 and Zeira, US 2002/0006122.

Re claim 54, Cheong fails to teach the subject matter cited in claim 54. However, Hafeez teaches the processor (fig. 1) is arranged before determining any estimates to calculate at least one of: the matrix product of the channel transfer function multiplied by itself (fig. 8. col. 5, line 51-65); the squared length of the channel impulse response for at least one signal received by at least one receiving element (fig. 5. col. 7, line 49-56). But, the combined teaching of Hafeez and Cheong as a whole fails to teach that an inner function defined by the received signal multiplied by the channel impulse response. However, Zeira teaches such aspects (col. 7, para[0052]) in which the channel response [overcome (h)] are obtained successively by an inner product or function of successive rows of T with the average of W-length segments of the received vector [overscore(r)].

Therefore, the combined teaching of Cheong, Hafeez and Zeira as a whole would have rendered obvious the limitations of: the matrix product of the channel transfer function multiplied by itself; the squared length of the channel impulse response for at least one signal received by at least one receiving element; and an inner function defined by the received signal multiplied by the channel impulse response as claimed, in order to calculate every burst stored in the burst buffer so that the survivor processor takes input from the burst buffer and the survivor buffer and for each survivor calculates the quantity.

Re claims 57-74, which recite limitations encompassed in claims 38-56.

Therefore, claims 57-74 have been analyzed and rejected with respect to claims 38-56.

Allowable Subject Matter

7. Claim 55 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. Chennakeshu et al pertains to the method and apparatus for canceling adjacent channel signals in digital communications systems.
- b. Lin et al pertains to the constellation-multiplexed transmitter and receiver.

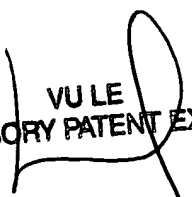
Contact

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nurul M. Matin whose telephone number is 571-270-1188. The examiner can normally be reached on mon-fri (7:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vu Le can be reached on 571-272-7332. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nurul Matin


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SUPERVISORY PATENT EXAMINER